Trend Study 2-23-01

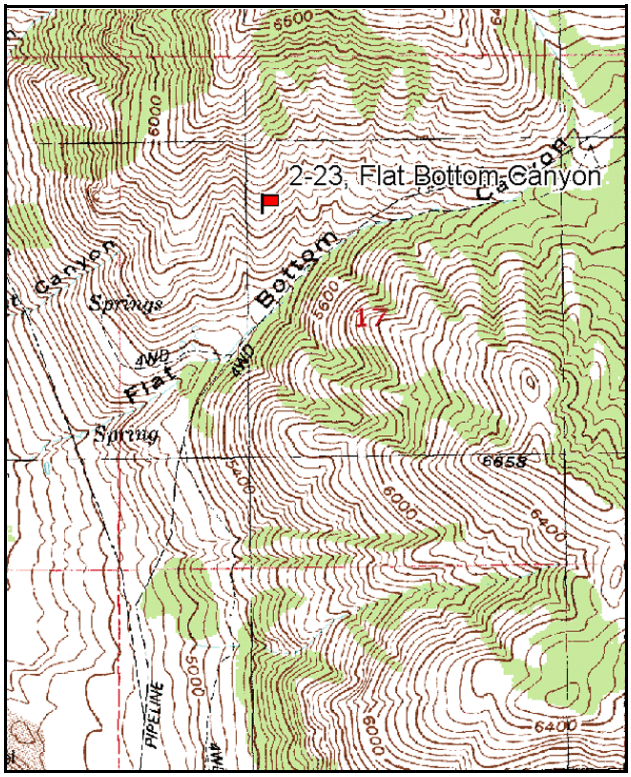
Study site name: Flat Bottom Canyon . Vegetation type: Big Sagebrush .

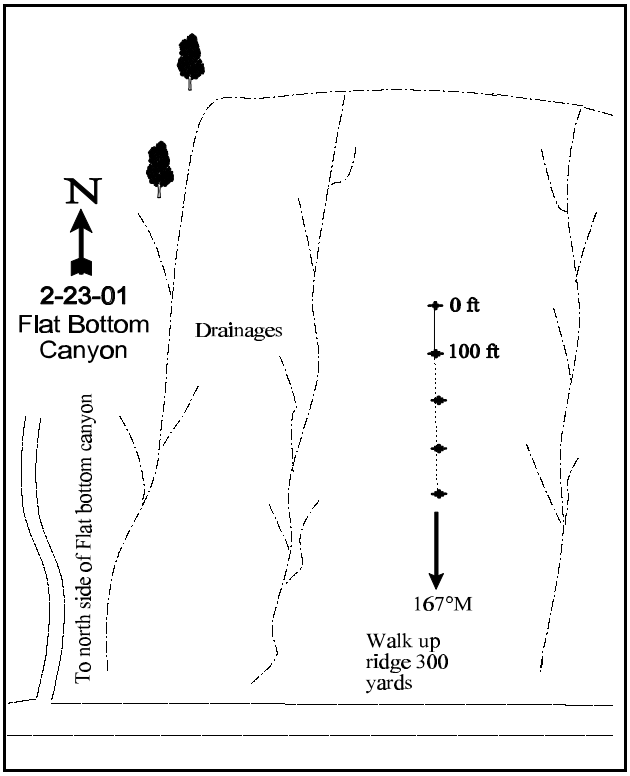
Compass bearing: frequency baseline 167 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: Belt 5 on 1 ft.

LOCATION DESCRIPTION

Ask for permission and directions to the mouth of the canyon at the Bingham sand and gravel pit. Four-wheel drive is needed. From mouth of canyon proceed to the ridge on north side of canyon where the site is located. Walk up the ridge about 300 yards to the 400-foot stake. The 0-foot baseline stake is further up the ridge. The 0-foot stake is marked with browse tag #7919. This site can be reached by following aqueduct road in Box Elder Canyon and around the bench to Flat Bottom Canyon.





Map Name: Mount Pisgah

Diagrammatic Sketch

Township 9N , Range 1W , Section 17

UTM 4596766 N, 418054 E

DISCUSSION

Trend Study No. 2-23

The Flat Bottom Canyon trend study site is located on a steep (50%), south-facing slope located east of Brigham City. Utilized by deer in winter, the study area produces relatively little forage. A very shallow soil almost certainly limits plant growth and plant densities on the steep south slopes of the canyon. A pellet group transect read in 2001 estimated 25 deer use days/acre (63 ddu/ha). Most of the pellet groups appeared to be from late spring use. There were more pellet groups near the bottom of the slope where the density of sagebrush was higher.

The soil is shallow and very rocky with a loam texture and a soil reaction that is moderately acidic (pH of 5.9). Effective rooting depth (see methods) was estimated at only 7 inches in 1996. Parent material is quartzite. Effective moisture on the site is limited by the convex steep and rocky slope. In addition, soil temperature is relatively high averaging 69° F at 9 inches. Soil erosion is inevitable, but is not currently serious due to the abundance of rock and herbaceous vegetation cover. There is little bare soil exposed and the erosion condition class was classified as stable in 2001.

This site is currently dominated by annual grasses and weedy forbs. Browse is a minor component, consisting chiefly of a low-growing population of mountain big sagebrush. Density was estimated at 2,232 plants/acre in 1984, nearly half of which were young plants. The average mature plant measured only 6 inches in height, obviously stunted by the harsh conditions of the site. By 1990, density was determined to be 566 plants/acre and by 1996, only 200 plants/acre were estimated. This most recent drop in density cannot be explained by heavy use as there were very few dead plants found on the site. Therefore, this last downward change in the population is mostly be due to the larger sample size giving a more accurate estimate for populations that are discontinuous and/or clumped. Utilization was moderate to heavy in 1984 and more moderate in 1990. The population continued to drop in 2001 due to a decline in young plants (140 plants/acre down to 0). Mature plants display moderate use but appear vigorous. They are not producing much seed, and annual leader growth averaged 2.6 inches in 2001. Mature plants are short and apparently stunted due to the poor site potential combined with continual use by deer and dry growing conditions. The upper south slopes of the canyon are all depleted of sagebrush. More sagebrush is found near the bottom of the canyon where the soil is deeper.

The only abundant browse species on the site consists of broom snakeweed which has increased in density from 1,065 plants/acre in 1984 to 3,240 in 1996, and 4,760 by 2001. The age class distribution suggested an expanding population in 1996 with 30% of the population consisting of young plants. The current (‘01) population is mostly mature (93%) and the large number of young plants encountered in 1996 has declined to only 1% of the population.

Annual grasses and weedy forbs are very abundant, especially lower on the slope. Cheatgrass, rattlesnake brome, and rattail fescue dominate the herbaceous understory by producing 75% of the grass cover and 57% of the herbaceous cover in 1996. Cover of annuals declined somewhat in 2001 but they still provide 53% of the grass cover. Bluebunch wheatgrass, red three-awn, and Sandberg bluegrass are moderately abundant. Forbs are dominated by pale alyssum, ragweed, and storksbill. Dyers woad is also found on the site. It has persisted at a stable frequency since 1990.

1984 APPARENT TREND ASSESSMENT

The soil is in poor condition. The study area has a very shallow soil that has very low growth potential. Ongoing erosion creates a situation favorable to annuals and weeds that are able to complete their growth cycle early in the season. Vegetative trend appears to be declining. It appears that big sagebrush is slowly going out.

1990 TREND ASSESSMENT

The many heavily hedged sagebrush encountered in 1984 are now mostly dead. Density is significantly lower, down by 75%. The small remaining sagebrush are vigorous, showing light to moderate use. The population of big sagebrush appears to be stable now, but at much lower levels. However, this severe winter range can receive concentrated use, and considering the low amount of forage produced, the heavy ant and aphid infestation and aggressive potential invaders, there appears little chance for reversal of the downward trends. There is continuous soil loss, and the potential for severe soil erosion and gullies on the steep face is present. There is extensive rock and pavement cover values.

TREND ASSESSMENT
soil - down and in poor condition (1)
browse - down and in poor condition (1)
herbaceous understory - stable but in poor condition (3)

1996 TREND ASSESSMENT

Trend for soil is up due to a decline in percent bare ground and an increase in litter cover. Unfortunately, the improvement in ground cover comes primarily from annual grasses and forbs. Some erosion is inevitable, but it currently does not appear excessive. Soil condition is poor however. The browse trend is down due to a 65% decline in the density of mountain big sagebrush. Currently, there are only 200 sagebrush plants/acre on the site. Mature plants number only 60 plants/acre. Drought combined with the low water holding capacity of the rocky soil, high surface temperatures, and competition with winter annuals are eliminating sagebrush from the site. Trend for the herbaceous understory is down slightly due to a significant decline in the sum of nested frequency for perennial grasses. Both bluebunch wheatgrass and Sandberg bluegrass declined in nested frequency. Sum of nested frequency for forbs increased primarily by a 12-fold increase in sum of nested frequency for ragweed. The site is in poor condition and supports a poor composition of perennial grasses and forbs.

TREND ASSESSMENT
soil - up but in poor condition (5)
browse - down with very few browse on the site (1)
herbaceous understory - down slightly and in poor condition (2)

2001 TREND ASSESSMENT

Trend for soil is slightly down due to a 53% decline in litter cover. Percent bare ground has increased slightly but it is still low at only 6%. There is some inevitable soil movement down slope but the high cover of rock and pavement help armor the soil. The current erosion condition class is classified as stable. Trend for browse continues to decline. Density of mountain big sagebrush has dropped 20% to only 160 plants/acre. Utilization is moderate and vigor normal. Density of rubber rabbitbrush has increased but these shrubs appear to be unutilized. Another negative trend indicator is the increase in broom snakeweed which is currently estimated at 4,760 plants/acre. Trend for the herbaceous understory is up slightly due to a significant increase

in several perennial grasses, combined with a decline in the frequency of cheatgrass and rattlesnake brome. Unfortunately, annual forbs also increased substantially with pale alyssum, storksbill and *Holosteum umbellatum* increasing significantly. The composition of the herbaceous understory is still poor and will most likely not improve.

TREND ASSESSMENT
soil - down slightly and in poor condition (2)
browse - down with very few browse on the site (1)
herbaceous understory - up slightly and in poor condition (4)

HERBACEOUS TRENDS --
Herd unit 02 , Study no: 23

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron spicatum	$_{c}$184	$_{bc}$182	$_{ab}$126	$_{a}$117	68	75	59	52	4.07	4.67
G	Aristida purpurea	$_{a}$9	$_{b}$38	$_{b}$48	$_{c}$86	4	18	24	37	1.17	2.61
G	Bromus brizaeformis (a)	-	-	$_{b}$152	$_{a}$70	-	-	63	36	1.00	.20
G	Bromus japonicus (a)	-	-	-	4	-	-	-	2	-	.01
G	Bromus tectorum (a)	-	-	$_{b}$387	$_{a}$330	-	-	99	100	16.60	7.41
G	Festuca myuros (a)	-	-	$_{a}$87	$_{b}$278	-	-	32	83	.91	5.73
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{a}$10	$_{b}$46	-	-	4	21	.02	.75
G	Poa secunda	$_{b}$162	$_{c}$234	$_{a}$70	$_{b}$184	67	94	35	74	1.00	4.06
Total for Annual Grasses		0	0	626	682	0	0	194	221	18.51	13.36
Total for Perennial Grasses		355	454	254	433	139	187	122	184	6.28	12.11
Total for Grasses		355	454	880	1115	139	187	316	405	24.79	25.48
F	Achillea millefolium	-	-	2	11	-	-	1	4	.03	.19
F	Agoseris glauca	-	6	10	-	-	2	4	-	.05	-
F	Alyssum alyssoides (a)	-	-	$_{a}$127	$_{b}$296	-	-	52	95	.38	1.07
F	Allium spp.	-	-	-	-	-	-	-	-	-	.00
F	Ambrosia psilostachya	$_{b}$83	$_{a}$13	$_{c}$152	$_{b}$75	31	7	56	34	4.23	1.82
F	Artemisia ludoviciana	$_{b}$39	$_{a}$10	$_{a}$9	$_{a}$5	14	3	5	2	.22	.06
F	Astragalus convallarius	-	-	-	2	-	-	-	1	-	.00
F	Astragalus utahensis	$_{a}$2	$_{a}$1	$_{b}$21	$_{ab}$12	1	1	11	5	.49	.07
F	Balsamorhiza hookeri	-	4	-	-	-	1	-	-	-	-
F	Cymopterus spp.	$_{a}$-	$_{b}$33	$_{b}$24	$_{b}$21	-	19	12	13	.08	.14
F	Draba spp. (a)	-	-	$_{a}$-	$_{b}$37	-	-	-	11	-	.20
F	Epilobium brachycarpum (a)	-	-	6	-	-	-	3	-	.02	-
F	Erodium cicutarium (a)	-	-	$_{a}$140	$_{b}$217	-	-	55	72	1.21	4.96
F	Erigeron spp.	-	-	2	-	-	-	1	-	.15	-
F	Eriogonum umbellatum	-	-	4	2	-	-	3	1	.09	.03

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Hackelia patens	-	-	-	3	-	-	-	1	-	.00
F	Helianthus annuus (a)	-	2	-	-	-	1	-	-	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$21	$_{b}$212	-	-	9	73	.04	.86
F	Isatis tinctoria	13	16	25	14	7	8	16	7	.13	.20
F	Lactuca serriola	-	-	3	-	-	-	1	-	.00	-
F	Tragopogon dubius	30	18	33	25	13	8	14	12	.36	.26
F	Unknown forb-perennial	1	-	-	-	1	-	-	-	-	-
Total for Annual Forbs		0	2	294	762	0	1	119	251	1.66	7.10
Total for Perennial Forbs		168	101	285	170	67	49	124	80	5.86	2.81
Total for Forbs		168	103	579	932	67	50	243	331	7.53	9.91

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 02 , Study no: 23

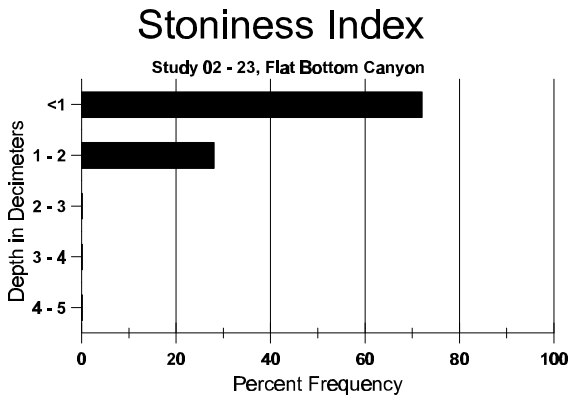
Type	Species	Strip Frequency		Average Cover %	
		'96	'01	'96	'01
B	Artemisia tridentata vaseyana	7	5	.18	.03
B	Chrysothamnus nauseosus hololeucus	3	5	.53	1.39
B	Gutierrezia sarothrae	54	69	1.46	4.40
B	Opuntia spp.	1	6	-	.01
Total for Browse		65	85	2.17	5.83

BASIC COVER --
Herd unit 02 , Study no: 23

Cover Type	Nested Frequency		Average Cover %			
	'96	'01	'84	'90	'96	'01
Vegetation	397	391	2.25	9.50	42.44	47.72
Rock	311	315	16.50	18.00	18.50	17.84
Pavement	275	326	18.25	33.25	10.93	19.59
Litter	397	351	40.00	22.50	41.72	19.67
Cryptogams	147	127	6.00	4.25	1.90	2.01
Bare Ground	110	179	17.00	12.50	1.45	6.20

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 23, Flat Bottom Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
7.1	69.2 (9.0)	5.9	48.2	29.4	22.4	1.8	10.7	140.8	.3



PELLET GROUP FREQUENCY --
Herd unit 02 , Study no: 23

Type	Quadrat Frequency '96	Quadrat Frequency '01	Pellet Transect Pellet Groups per Acre '01	Pellet Transect Days Use per Acre (ha) '01
Deer	7	5	331	25 (63)

BROWSE CHARACTERISTICS --
Herd unit 02 , Study no: 23

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	43	56	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	00%	00%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	0		-
	'01	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	20	9	3	-	-	-	-	-	-	28	2	2	-	1066			32
	90	2	-	1	-	-	-	-	-	-	1	2	-	-	100			3
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	9	6	6	-	-	-	-	-	-	20	1	-	-	700	6	6	21
	90	5	4	1	-	-	-	-	-	-	4	6	-	-	333	8	10	10
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	13	22	3
	01	2	5	-	-	-	-	-	-	-	7	-	-	-	140	13	27	7
D	84	-	1	13	-	-	-	-	-	-	7	6	1	-	466			14
	90	3	1	-	-	-	-	-	-	-	1	3	-	-	133			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	24%	33%	04%	-75%
'90	29%	12%	00%	-65%
'96	00%	00%	00%	-20%
'01	63%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	2232	Dec:		21%
'90	566			23%
'96	200			0%
'01	160			13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus hololeucus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	32	54	1
	01	4	-	-	-	-	-	-	-	-	4	-	-	-	80	31	51	4
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	+50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	0	Dec:		0%
'90	0			0%
'96	60			0%
'01	120			17%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	90	6	-	-	1	-	-	-	-	-	7	-	-	-	233			7
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	19	-	-	-	-	-	-	-	-	18	-	1	-	633			19
	96	48	-	-	-	-	-	-	-	-	48	-	-	-	960			48
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	26	-	-	-	-	-	-	-	-	26	-	-	-	866	9	12	26
	90	52	1	-	-	-	-	-	-	-	52	1	-	-	1766	7	8	53
	96	100	-	-	1	-	-	-	-	-	101	-	-	-	2020	9	13	101
	01	221	-	-	-	-	-	-	-	-	221	-	-	-	4420	8	16	221
D	84	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
	01	15	-	-	-	-	-	-	-	-	3	-	-	12	300			15
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+56%
'90	01%	00%	01%	+25%
'96	00%	00%	00%	+32%
'01	00%	00%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	1065	Dec:	12%
	'90	2432		1%
	'96	3240		8%
	'01	4760		6%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	1	-	-	-	-	-	2	-	-	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66	7	11	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	10	1
	01	5	-	-	-	-	-	-	-	-	5	-	-	-	100	2	8	5
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+33%
'90	00%	00%	00%	-80%
'96	00%	00%	00%	+88%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	0%
	'90	99		33%
	'96	20		0%
	'01	160		13%